Exploring the phenomenon of premature aging in people with disability

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Abstract

Premature aging among people with disabilities is a phenomenon commonly observed, yet not carefully evaluated. In this study, the psycho-social pathway of premature aging process in people with disabilities is explored. Multiple logistic regression analysis is performed to measure the association between self-perception of health, mental health and satisfaction with life and people with disabilities while controlling for age, sex education and income level. Additional multiple logistic regression is conducted to measure the association between sense of belonging in a community and self-perception of health, mental health and satisfaction with life among people with disabilities. The result showed that people with disabilities are 92% less likely to report good self perception of health; 85% less likely to report good self perception of mental health; 84% less likely to report satisfaction with life compare to people without disabilities. Among people with disabilities, people who reported a good sense of belonging in a community is 2.4 times more likely to have good perception of health; 5.1 times more likely to have good perception of their mental health; 3.7 times more likely to report satisfaction with life compare to people with disabilities who reported a poor sense of belonging in a community. Based on results, recommendation on improving social and physical environment surrounding people with disabilities were made to help mitigate the phenomenon of premature aging in people with disabilities.

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Introduction

According to the Public Health Agency of Canada (2010), the percentage of senior citizens in the total population is projected to increase over the next 30 years and reach the maximum of 40% in the total population. Therefore, the well-being and health of senior citizens will be an important focus of the health care services. The major factors that impact the health status of senior citizens are: cancer, chronic conditions such as diabetes and hypertension, infectious diseases as a result of weakened immune systems, and decreased mobility and functional health due to either natural aging, falls or related injuries. Among these senior citizens, the group of people with disability is even more vulnerable to these health risks since the aging process or onset in this group is observed to be faster compare to people living without disabilities.

This unique phenomenon of premature aging is a significant public health concern because it showed that people with disabilities might need to prepare for the aging process earlier than people without disabilities. The understanding of the premature aging phenomenon would provide guidance on how to prevent such progression as well as insights on the development of coping strategies for people with disabilities.

Literature Review

The phenomenon of aging is usually referring to the natural progression of biological, psychological and social functioning after the point of maximum development (JLK Disability policy consultant, 2001). For decades, research on the aging process has been conducted to evaluate the biological, psychological and social

well-being of the general public and it provide a base-line data to compare it with specific population group such as people with disability. Some notable aging phenomenons among people with disability are summarized as (JLK Disability policy consultant, 2001):

1. Rates of respiratory illness are four times higher in persons with post-polio syndrome

2. Diabetes is five to six times higher in many disability groups

3. Cardiovascular disease is more prevalent in people with disability

4. Fractures are five times more common in persons aging with cerebral palsy

5. Nearly 70% of people with mobility disability suffer from osteoporosis

Through years, different theories have been developed to explain the early aging phenomenon among the group of people with disability. For example, some hypothesize that certain forms of disability caused an metabolic change that accelerates the biological aging process; some hypothesize that living with a disability for a long period of time increases stress on human bodies and the amount of wear and tear decreases the functional ability of organs, bones and muscles; some hypothesize that unaccommodating physical environment and living conditions are the major causes for aging acceleration among people with disability. In order to carefully assess each hypothesis, careful examination of the definition of disability is merited.

According to International Classification of Functioning, Disability and Health (2016), disability is defined as a condition or function judged to be significantly impaired relative to the usual standard of an individual or group. The condition is generally

classified into physical impairment, sensory impairment, cognitive impairment, intellectual impairment or various types of chronic diseases. And based on these types of impairment, disability are usually broken down into four subcategories: mobility disability, hearing disability, vision disability, and cognitive or learning disability. All these forms of disability can be either congenital(meaning born with the disability) or acquired (resulted from injury, accidents or diseases).

Yorkston et al. (2010) examined issues related to aging with disabilities from the perspective of the person with disabilities by conducting focus group among people with disability. They found that multiple pathways exist that influence the self-reported health status of people with disabilities. Physical pathways such as progression of physical symptoms like joints and back pain and psycho-social pathway such as emotional well-being and strategies to deal with disability are two of the most important areas where the health care services should allocate their resources. It is depicted that the physical pathway is often much harder to intervene upon compared to the psycho-social pathway. Improvement along the psycho-social pathway such as promoting positive attitude is shown to be effective and efficient in improving self-reported health status (Yorkson et al., 2010).

Molton et al. (2014) attempted to model secondary health conditions in aging people with disabilities. They found that in addition to functional impairments, physical pain and chronic medical conditions, psycho-social difficulties is one of the most influential factor (Molton et al., 2014). Moreover, Linear relationship is also found between physical pain and psycho-social difficulties, indicating a complex interrelation between physical function and psychological function.

From another perspective, instead of comparing between the general public and the group of people with disabilities, Verbrugge & Yang (2002) compared and contrasted between people who have early-onset disabilities with people who have mid- or late-life onsets disabilities. They found that both group have reduced social interactions compared to the general public; however, people with early-onset disabilities displayed higher social participation compare to people with mid or late-onset of disabilities. This difference is attributed to the time it takes for a person to adjust his/her lifestyle after acquiring the disability. Hence, services providers should provide tools and environment for people with mid or late-onset of disabilities to adjust better and quicker accordingly.

Stated by Chappell and Cooke (2010), human body grows old gradually and there is no certain age that designated for being old. However, with increasing in age, the likelihood of disability increases as well. Out of all possible forms of disability, mobility disability is particularly important because impairment in mobility limit individual's ability to be independent. When individual experiences injury or other situations that lead to mobility disability, his living environment plays a key role in helping him adapting to the new environment (Chappell, 2010). For example, accessible homes helped European adults to be more independent in their daily life and activities because they feel that their home situation is contingent upon their own behavior as opposed to external influences. Physical environment plays an important part in intervention in helping people with mobility disability and community councilors and researchers should engage with people with mobility disability to optimize the therapeutic nature of community and institutional dwellings.

Hunsberger et al. (2005) stated that the key to successful aging with a disability is to learning how to accept “deeper water” and learning that “deeper water does not mean drowning”. The detailed strategies depicted can be summarized in five parts: 1. Commit time and energy to form a healthy Identity (balance between “being” and “doing”) 2. Recognizing and accepting a becoming approach to life, attaining balance through pacing 3. Accepting a pro-active approach to manage depression, fatigue, isolation, anxiety and loneliness through using animal assisted services. 4. Maintaining the spirit of to face the challenge of aging with disability by sharing stories and learning to self-disclose 5. Embracing occupational potential by learning to be resourceful and interdependent. It is apparent that all these strategies involves self-identification of weakness and facing the weakness through social interactions and sharing among people with similar experiences. Therefore, establishing a social identity such as a community is extremely important in assist people with disability to cope with the aging process.

It is not difficult to see the commonality among the existing literature that the major focus of coping with aging process for people with disability is to engage in social interaction and establish an accommodating and accessible physical environment that promotes social interactions. The biological pathway of aging process among people with disabilities is often much harder to examine due to variability in different forms of disability while the psycho-social pathway can be observed across different types of disability.

Purpose

The purpose of this project is to explore the phenomenon of early aging in people with disabilities by examining specific psycho-social variables that are associated with disabilities. My hypothesis is: the process of premature aging is associated with social interaction among people with disabilities. Statistical analyses are conducted to evaluate these variables and their relationship to premature aging in this population. Recommendations on coping strategies of aging process for people with disabilities are made based on the results.

Methods

Canadian Longitudinal Study on Aging (2017) is a long-term national study funded by Canadian Institutes of Health Research. This study aims to understand how to age in healthy fashion and identify risk factors in the aging process. In this study, biological, psychological, clinical and societal factors are collected longitudinally for more than 50,000 men and women. This provides a ideal starting point for understanding the aging process among people with disabilities. However, the access to the database of CLSA exceeds the time constraint for this project and I have decided to use alternative data source that is easier to access. It is recommended for future researchers to utilize the CLSA database since it is one of the most comprehensive database that includes great amount of variables.

The data source for this project is Statistics Canada (2013) and all the variables used in the analysis are extracted from Public Use Microdata File of Canadian Community Health Survey conducted in year 2011-2012.

In order to explore the phenomenon of premature aging in people with disability, we need to first define the outcome variable (premature aging) in this project. Traditionally, aging process is defined as an age-dependent decline in intrinsic physiological function, leading to an increase in age-specific mortality rate and a decrease in age-specific reproductive rate (Flatt, 2012). However, this paper aims to look at aging in the psychosocial pathway due to the limitation of the availability of specific variables in data source. To define premature aging I used three particular variables in the data source: self perception of health (GENDHDI), self perception of mental health (GENDMHI), and general satisfaction level with life (GENGSWL). These three variables are the outcome variables in this analysis. These outcome variables were collected individually through Canadian Health Community Survey. The reasoning is that given that an individual with disabilities and an individual without disabilities is at the same biological age, if the individual is less likely to report satisfactory results to the three variables listed above, the phenomenon of premature aging exists because psychosocially people with disabilities have worse impression of their health status at the same biological age.

The exposure variable in this analysis is people with disability. Similar to premature aging, people with disabilities were not uniquely classified in the data source. Since there are different types of disabilities and it is often difficult to characterize people with disabilities . In this project, functional variables will be used to characterize people with disability. This functional variable (ADLF6R) is derived from the following variables:

1. ADL_01: Needs help for preparing meals

2. ADL_02: Needs help for getting to appointments/running errands

3. ADL_03: Needs help for doing housework

4. ADL_04: Needs help for personal care

5. ADL_05: Needs help for moving about inside the house

6.ADL_06: Needs help for looking after personal finances

If the answer to any of the above questions is yes, the individual is characterized as people with disability. Otherwise, the individual is characterized as people without disability.

The following covariates were selected to control confounding in the statistical models.

1. Sex(DHH_SEX)

2. Age(DHHGAGE)

3. Total household income (INCGHH)

4. Educational level(EDUDR04)

Data transformation (dichotamization and elimination) is performed for some variables to construct a statistical model that is easy for interpretation(Appendix 1). Hence, policy maker can prioritize action strategy to cope with premature aging in people with disability based on the results generated. After the data transformation, the total sample size is reduced to 41,362 and the following logistic regression models are constructed to measure association between people with disability and multiple premature aging outcomes:

1. Logit(Perceived Health (Y1)=good)

$=\beta_{dis}*dis+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

2. Logit(Perceived Mental Health (Y2)=good)

$=\beta_{dis}*dis+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

3. Logit(Satisfaction With Life (Y3)=satisfied)

$=\beta_{dis}*dis+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

The following logistic regression models are constructed to measure how sense of belonging to a community related to the premature aging outcomes in people with disability (total sample reduced to n=4,582):

1. Logit(Perceived Health (Y1)=good)

$=\beta_{nsb}*nsb+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

2. Logit(Perceived Mental Health (Y2)=good)

$=\beta_{nsb}*nsb+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

3. Logit(Satisfaction With Life (Y3)=satisfied)

$=\beta_{nsb}*nsb+\beta_{sex}*sex+\beta_{age}*age+\beta_{income}*income+\beta_{education}*education$

In summary, the analysis uses multiple logistic regression to measure the association between people with disability and premature aging with various covariates first as illustrated in Figure.1. Additional multiple logistic regression will be conducted afterwards among people with disabilities to measure the association between social factors and premature aging outcome.

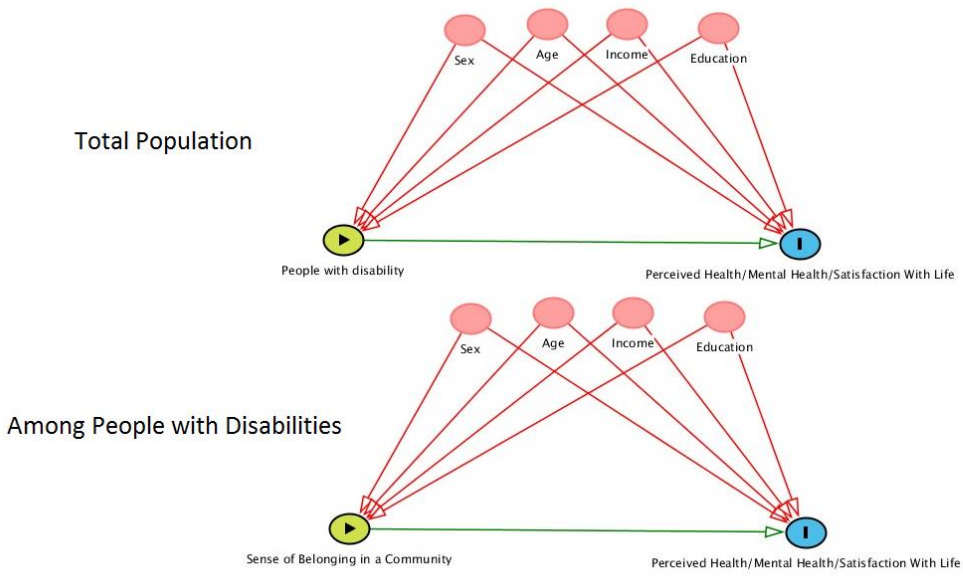

Figure 1. Analysis Framework of the study

Results

As illustrated by Table.1, the available total number of individuals in this analysis is 41,362 after data transformation. The distribution of the sociodemographic variables among this study population is listed in Table.1. The study population has more female subjects (56%) than male subjects(44%). The age distribution of the study population is 18% for people who are between 12 to 24 years old; 25% for people who are 25 to 44 years old; 32% for people who are 45 to 64 years old and 25% for people who are more than 65 years old. 70% of the study population is considered to have relatively high annual household income (>$40,000) while 30% of the study population is considered to have relatively low annual household income (<$40,000). 41% of the study population is considered to have relatively low level of education (high school or lower) while 59% of

the study population is considered to have relatively high level of education (post-secondary or higher).

Table 1. Descriptive statistics of sociodemographic variables among study population

		N(%)
Total Population		41,362(100)
Sex		
	Female	23,021(56%)
	Male	18,341(44%)
Age		
	12-24	7,240(18%)
	25-44	10,272(25%)
	45-64	13,406(32%)
	65+	10,444(25%)
Income Level(house hold)		
	<$40,000	12,196(30%)
	>$40,000	29,166(70%)
Education level		
	High School or lower	17,113(41%)
	College or higher	24,249(59%)

Table 2. gives the set of results of the multiple logistic regression for the purpose of measuring the association between premature aging variables and people with disabilities while controlling for sex, age, education and household income level. All the results in Table.2 are statistically significant as the 95% confidence interval does not

contain the null value 1.0 (meaning no association). For perceived health, people with disabilities are 92% less likely to report good self perception of health compare to people without disabilities. For perceived mental health, people with disabilities are 85% less likely to report good self perception of mental health compare to people without disabilities. For satisfaction with life, people with disabilities are 84% less likely to report satisfaction with life compare to people without disabilities. This set of results has demonstrated that people with disabilities are negatively associated with good impression of their health status which confirmed the phenomenon of premature aging among people with disabilities in the psycho-social pathway.

Table 2. Odds ratio for people with disability from multiple logistic regression models

Regression Models	OR(95% CI) for people with disability(DIS)	P-Value
Perceived health (Y1)	0.08 (0.07-0.09)	< 2^(-16)
Perceived Mental Health (Y2)	0.15 (0.12-0.18)	< 2^(-16)
Satisfaction with Life (Y3)	0.16 (0.14-0.19)	< 2^(-16)

Note: N=41,362, odds ratio in association with people with disability and premature aging outcome. Models adjusted for sex, age, income, and education.

Table. 3 Shows the results of a multiple logistic regression model that measures the association of the sense of belonging in a community and premature aging outcomes while controlling for sex, age, education and household income level. All the results in Table.3 are statistically significant as the 95% confidence interval does not contain the null value 1.0 (meaning no association). For perceived health, people with disabilities who reported a good sense of belonging in a community is 2.4 times more likely to have good perception of their health compare to people with disabilities who reported a poor sense of belonging in a community. For perceived mental health, people with disabilities

who reported a good sense of belonging in a community is 5.1 times more likely to have good perception of their mental health compare to people with disabilities who reported a poor sense of belonging in a community. For satisfaction with life, people with disabilities who reported a good sense of belonging in a community is 3.7 times more likely to report satisfied result compare to people with disabilities who reported a poor sense of belonging in a community.

Table 3. Odds ratio for sense of belonging in a community from multiple logistic regression models among people with disability

Regression Models	OR(95% CI) for Sense of belonging in a community	P-Value
Perceived health	2.4 (2.1-2.8)	< 2^(-16)
Perceived Mental	5.1 (3.8-6.9)	< 2^(-16)
Satisfaction with	3.7 (3.0-4.6)	< 2^(-16)

Note: N=4,582, odds ratio in association with sense of belonging and premature aging outcome. Models adjusted for sex, age, income, and education

Discussion

According to the results of the analysis, the phenomenon of premature aging among people with disabilities on psycho-social pathway is supported by multiple logistic regression results displayed in Table 2. It demonstrated that for the same biological age, people with disabilities have lower self-perception of their health, mental health and lower satisfaction with life compare to people without disabilities. The multiple logistic regression results displayed in Table 3. demonstrated the importance of social environment and its role in the development of premature aging. Self-perception of health, mental health and satisfaction of life all improved significantly when people with disabilities identify themselves as a part of a community. In the case of

self-perceived mental health, the odds ratio indicated that people with disabilities who have a good sense of belonging in a community are more than five times more likely to feel good about their mental health status. It demonstrates the crucial role of social interaction and social environments in the psycho-social pathway of premature aging in people with disabilities. The potential underlying mechanism is that social interaction and social environments surrounding people with disabilities directly relates to the amount of physical and social activities this group participates in. These activities greatly influence how people with disabilities perceived their age and health status. This provides public health practitioner insights on potential solutions to tackle the problem of premature aging among people with disabilities through mediation strategies on the psycho-social pathway.

Ohry et al. (2015). stated that the phenomenon of premature aging in people with disability can be resulted from different pathways such as physical pathways characterized by "wear and tear resulting in decline of physical functions" or psycho-social pathway influenced by the homeostasis of the internal and external environment of people with disabilities (Ohry et al., 2015). The psycho-social pathway is characterized by prolonged physical, psychological and social stress; specifically, after acquiring a form of disability, the process of restoring a new balance between physical capability and psychological well-being for people with disabilities can be overbearing and premature aging could manifest from the psychological stress of the restoration process (Ohry et al., 2015). These authors also identified a common risk factor for both pathways: hypo-activity. It is found that among people with disabilities, reduction in both physical activities and social activities are both associated with higher incidences of

premature aging. One potential explanation is that due to the reduction of these activities, the individual lacks the opportunity to exercise parts needed for these activities, resulting in swifter degeneration of cells and tissues and hence reducing functional ability (Ohry et al., 2015).

Lafortune et al. (2016) identified several behavioral risk factors associated with successful aging in mid-life adults: amount of physical activities, smoking status, alcohol consumption and healthy diet. Among these risk factors, physical activities were shown to be correlated with multiple outcome such as cardiovascular disease risk, diabetes risk, dementia risk and cognitive function (Lafortune et al., 2016). Physical activities is also shown to be effective at expanding the social network surrounding individuals to facilitate coping with the aging process (Lafortune et al., 2016). Unlike people without any form of disabilities, it is more difficult for people with disabilities o engage in any form of physical activities. Specifically, people with physical impairment have extreme disadvantages and barriers since the surrounding physical environment does not accommodate for difficulties encountered by this group. Therefore, it is reasonable to think that intervention in providing accommodated physical environment for people with disabilities could help people with disabilities to age more successfully.

Hanson (2015) conducted a qualitative study to explore the definition of successful aging among people with disabilities. During the interview and focus groups, frequent activities (physical and social), social and family interactions, acceptance of disability and sense of worth were the most frequent terms brought up by the participants (Hanson, 2015). It is apparent to see that among people with disabilities, the definition of successful aging involves a tremendous amount of social support both internally and

externally. Internally, from family support and interactions, the individuals gain better understandings of their conditions and start learning to accept it as a part of their life. Externally, the surrounding environment provides social support and opportunities for people with disabilities to engage in activities to improve the sense of worth to the society for people with disabilities.

In summary, the findings from the analysis in this study is consistent with findings from the literature. The role of social interaction and social environment surrounding people with disabilities is extremely important in prevention of premature aging on the psycho-social pathway. The intervention strategies of public health practitioners should target on improving the surrounding social environment to reduce and eliminate barriers preventing people with disabilities engaging in social activities.

Limitations & Future studies

The strength of this study is to provide clear explanation and interpretation of the results for public health practitioner to prioritize actions on resolving the phenomenon of early aging among people with disabilities. However, the specific approach of this study also resulted in several limitations.

The first limitation of this study is the broad definition of people with disabilities. In this study, functional variables were used to characterize people with disabilities. However, different types of disabilities could certainly impact different pathways of aging process and resulted in different outcomes. Roth et al. (1996) has found that persons with Down syndrome have features of premature aging that is detectable by

magnetic resonance imaging. Atrophy, white matter lesions and T2 hypo-intensity of the basal ganglia was observed to be higher in prevalence in persons with Down syndrome than person without Down Syndrome (Roth et al., 1996). Similarly, Jeste et al. (2011) documented that among people who have schizophrenia, individuals have accelerated physical aging but a normal rate of cognitive aging. The detailed mechanism remain a mystery because cognitive aging process among people who have schizophrenia is coupled with cognitive impairment starting from premorbid period and persisting through life (Jeste et al., 2011). It is clear that these two different disabilities impact the condition of premature aging differently. However, the purpose of this study is to provide general guidance for people with disabilities as a whole. Therefore, such limitation can be accepted since it is simply impossible to distinguish different types of disabilities from the data source. Future studies implicating specific types of disabilities are recommended to further evaluate the phenomenon of early aging is needed to provide specific guidance to specific type of disabilities.

The second limitation of the study is the narrow focus of the psycho-social pathway of premature aging. As discussed earlier, the physical pathway of premature aging is also extremely important. Although the physical pathway and psycho-social pathway might not be completely independent of each other, the measure of premature aging in physical pathway could provide more evidences and insights on the biological mechanism of premature aging process. Sanders & Newman (2013) discussed about the potential of using telomere length as a biomarker of aging. Telomeres are nucleoprotein caps flanking DNA, they are shortened as a result of cell division or reaction with molecules produced from oxidation stress which occurs more often as people ages

(Sanders & Newman, 2013). Since there is no information about any biomarkers in the data source of this study, evaluation of the physical pathway of premature aging process among people with disabilities were not considered. However, it is recommended that future studies evaluating the physical pathway of premature aging involve biomarkers to give a more accurate measure of the physical aging process. Canadian Longitudinal Studying on Aging (2017) is a comprehensive study that includes measures of some biomarkers in addition to commonly measured variables. It is a great database for future researches that want to explore the interaction between physical pathway and psycho-social pathway of premature aging among people with disabilities.

The third limitation of the study is the dichotimization of both variables of interests and covariates in the analysis. Dichotimizaiton was performed to produce results that are easy to interpret for policy makers to prioritize their actions on resolving the premature aging phenomenon. However, such data transformation could lose certain amount of information in the data. For example, the original questionnaire of all three outcome variables and the exposure variable were ranked on an ordered scale. Dichotimization were performed to separate "poor" response from the rest responses ranking from "Fair" to "Excellent" (see Appendix). Although this transformation is logically acceptable with respect to interpretation of the question, such transformation could result in unbalanced ratio of cases versus control. Hence, the overall effect can be estimated further away from the null as the number of cases become more and more rare. Since the sample size of this study is very large, the extent of such overestimation is small compare to the effect size observed. For covariates, taking the example of "age", it is separated into four different categories. This is because the age variable provided in

the data source is categorized into 16 different categories. Hence, it would be very difficult to interpret the results if no data transformation is performed. Moreover, the break-point of dichotimization process is selected subjectively. For example, the break-point of the variable of annual household income is selected at $40,000. Anything above $40,000 is considered a category while anything below $40,000 is considered another category. Selection of different break-points might affect the results to a certain degree. Hence, for future studies, analysis without dichotimization of the variables are recommended to provide more precision in the parameters of the analysis.

Last but not least, the odds ratio of association between the exposure variables and the outcome variables in the analysis do not infer any causal relationships. The data source of this project is a survey, which is a cross-sectional study method. In this type of study, the exposure variables and the outcome variables are collected at the same time. Therefore, there is no temporal relation between the exposures and the outcomes. For example, according to the result of the analysis, it is possible that people with disabilities have worse self perception of their health; it is also possible that people who have worse self perception of their health are more likely to become people with disabilities due to external factors. For instance, mental health status of an individual and mental disabilities can be the cause of each other; therefore, based on the result of this project, the odds ratio can only confirm the association relationship between the measured exposure variables and health outcome variables. For future studies, longitudinal data source can be an ideal starting point to establish the causal relationship because it is able to capture the temporal relationship of the exposure and outcome. Moreover, specific

biomarker can be an integral part in identifying the temporal relationship because it could provide an objective measure of the quantification of disabilities.

Conclusion

In conclusion, the psycho-social pathway of premature aging process in people with disabilities is explored by multiple logistic regression. The association between self-perception of health, mental health and satisfaction with life and people with disabilities is measured while controlling for age, sex education and income level. The association between sense of belonging in a community and self-perception of health, mental health and satisfaction with life among people with disabilities is also measured by multiple logistic regression. The result showed that people with disabilities are 92% less likely to report good self perception of health; 85% less likely to report good self perception of mental health; 84% less likely to report satisfaction with life compare to people without disabilities. Among people with disabilities, people who reported a good sense of belonging in a community is 2.4 times more likely to have good perception of health; 5.1 times more likely to have good perception of their mental health; 3.7 times more likely to report satisfaction with life compare to people with disabilities who reported a poor sense of belonging in a community.

Implication/Recommendation

According to the results of the study, the key focal area of improvement should be the physical environment surrounding people with disabilities. Aiming to create an environment that supports and activate the participation of social activities among people with disabilities should be the primary focus. Hammel et al. (2009) conducted a study among people with disabilities to gain a understanding of participation from the perspective of people with disabilities. The result showed that people with disabilities define participation as a flexible terminology which allows individuals to assert different values and interests (Hammel et al., 2009). This demonstrated that there is no single solution to improve the social participation level among people with disabilities. The public health practitioner need to engage different local disability communities to identify specific interests or values shared in the communities to identify specific programs of interest and provide such environment accordingly.

Although different disability communities share different values and interests, they also share common needs and similar structural framework. According to Naidoo et al. (2012), there are five focal areas that can be improved. The first area is to establish the bridge between aging and disability sectors. The second area is to expand the theoretical framework of aging to facilitate the bridge building. The third area is to engage in consumer participation and involvement. The fourth area is to improve the ability to transfer knowledge across different sectors. The fifth area is to creating lasting opportunities for support and services among people with disabilities. Putnam (2014) commented on the importance of generating the investment in bridging aging and disabilities research across different stakeholders. Hence, advocacy on the issue of

premature aging in people with disabilities is also essential for bridge building between aging community and disability community.

Braithwaite et al. (2009) demonstrated the use of computer technology could enhance the communication between people with disabilities and provide emotional and social support. Osman & Diah (2017) also stated that information communication technology is important for empowerment of people with disabilities in their social life. Control over daily life and independent living among people with disabilities can be greatly improved by the use of informational communication technology (Osman & Diah, 2017). For people with sensory impairment such as vision and hearing impairment, informational communication technology is even more valuable since this group rely on these technologies for daily communications. Osman & Diah (2017) also argue that proficiency in informational communication technologies also help improve self-esteem and community respect among people with disabilities because it help them remove the stigma that people with disabilities need to be taken care of and people with disabilities cannot live independently.

Considering both findings from this study and literature, the following recommendations are made for mediation of premature aging in people with disabilities:

1. Engaging local disability community to identify specific social values and interests

2. Involve different stakeholders such as government and non-profit organization to collaborate on establishment of local community centers to provide services towards people with disabilities

3. Provide training on modern technologies for people with disabilities to empower their social life and enable them to choose social participation based on their interests

4. Allocate more resources for research bridging the gap between aging community and disability community

5. Encouraging research on longitudinal data source while using biomarkers as an objective reference to measure the process of aging. One potential starting data source for such research is the Canadian Longitudinal Study on Aging (2017) using C-reactive protein(an biomarker used to measure general inflammation in body) as the objective measure of the aging process.

Reflection

As a public health practitioner, the practicum experiences and the capstone project broadened my views on issues among people with disabilities. I conducted my practicum at Richmond Center for Disability-a small non-profit organization providing services to people with disability. During the practicum, Richmond Center for Disability provided me an environment to experience professional practice in the disability community. I have my own working space and specific tasks are assigned to me. I have engaged in both individual work such as perform literature review and research as well as team work such as helping in the staff team to pass an accreditation by another agency. During these activities, I have had opportunities to improve my skills in conducting focus group and qualitative data analysis as well as my communication skills both among the staff and clients. In terms of public health practitioner, I would say it

approximates some aspects of the professional practices. However, since the site is a non-profit organization, it provided me a significant amount of time for myself to conduct individual work. I would think that in other agencies, the working schedule would be more planned and I would be under more supervision. Overall, I think Richmond Center for Disability is a decent practicum for experiencing public health practitioner professional practice.

One of the major insight I learned during my practicum is the "people first language" that is being used in the community of disability. It emphasize on using words or phrases such as "people with a disability or people with a condition" instead of using words or phrases such as "disabled people or deaf/blind". This helps improving the confidence and self-esteem for people with disability. At Richmond Center for disability, I have seen individuals with disability showing interest and taking initiatives in participating in a lot of different community events. This helps them to get involved and prevent them from excluding themselves socially. At first, I was not totally on board with the "people first language" and had some doubt in whether it actually has any impact. However, after my experiences at this practicum, I can see the impact it has made across the disability community. I can see the "people first language" to be successful in other population group as well. For chronic disease/conditions, I can see this technique to be useful to improve confidence/self-esteem for people to take initiatives in improving themselves and eventually reach a better state of health.

The most significant challenge that I encounter during the practicum experiences is to realize the difference between the research conducted for a health service delivery center compare to the research conducted academically. For research conducted at

academic setting, the researcher would focus on the rigorousness of the study design. For research conducted for conducted for a health delivery center, the facilitator would need to focus on other important areas such as making sure that the results of the analysis is easy to interpret and easy to understand for policy makers to prioritize and implement intervention strategies to mitigate the issues.

The phenomenon of premature aging among people with disabilities was brought up during a private meeting with Ella Huang-executive director of Richmond Center for disability. Through multiple years of experiences in providing services to people with disabilities, Ella has observed this phenomenon and shared her interest in this topic with me. We talked about different pathways that may contribute to this phenomenon and I have decided to conduct my capstone project on this topic. Based on my experiences during the practicum, I have decided to simplify the analysis methodology to improve knowledge translation from academic researchers to the services providers. Dichotomization of variables in the analysis was done to improve understanding of the methods and provide clear explanations of the results. In addition, throughout the writing of the capstone paper, I have made a conscious effort to use "people first language" to connect between public health practices and academic research. In summary, the practicum experiences and the capstone project has broadened my view on the disability community and improved my understanding on the issue of premature aging among people with disabilities. I have also strengthened my ability to conduct independent research and improved my analysis skills in both biostatistics and epidemiology.

References

1. Molton, I, R., Terrill, A, L., Smith, A, E., Yorkston, K, M., Alschuler, K, N., Ehde, D, M. & Jensen, M, P. (2014). Modeling Secondary Health Conditions in Adults Aging with Physical Disabilities. Journal of Aging and Health. 26(3): pp. 335-359.

2. Chappell, N, L., & Cooke H,A., (2010). Age Related Disabilities - Aging and Quality of Life. In: JH Stone, M Blouin, editors. *International Encyclopedia of Rehabilitation.*

3. Canadian Longitudinal Study on Aging (2017). *About the CLSA Research Platform.* CLSA. Retrieved from: https://www.clsa-elcv.ca/about-us/about-clsa-research-platform

4. June Isaacson Kalies, Disability Policy Consultant (2001). *Aging with disability*. Health Wellness and Aging with Disability. June Isaacson Kalies: Disability Policy Consultant.

5. Public Health Agency of Canada (2010). *The Chief Public Health Officer's Report on the State of Public Health in Canada 2010.* PHAC.

6. Hunsberger J., Shaw L., Schweitzer, Ann., & Burns S. (2005). *Aging with a disability: Strategies for enabling occupational transitions.* CAOT PUBLICATIONS.

7. International Classification of Functioning, Disabilities and Health (2016), *Disability: Definition, Types & Models*. ICF.

8. Verbrugge, L, M., & Yang, L, S.(2002). Aging with Disability and Disability with Aging. *Journal of Disability Policy Studies:* 12(4): pp 253-267.

9. Yorkston, K, M., & Mcmullan, K, K., Molton, I., & Jensen, M, P. (2010). Pathways of change experienced by people aging with disability: a focus group study. *Disability and Rehabilitation*: 32(20): pp1697-1704.

10. Flatt, T. (2012). A New Definition of Aging? *Frontiers in Genetics*. 3: pp 148.

11. Statistics Canada (2013), "Canadian Community Health Survey, 2011-2012 [2013]", Health Statistics Division [Distributor] V5 [Version]. Statistics Canada.

12. Ohry, A., Sullway, C., Broe, G, A., Tennant, J, A., & Ohry, S, Y. (2015). *Premature Aging: A Danger to Life Expectancy and Quality of Life of the Disabled.* Rehabilitation Medicine Section. Reuth Medical Center. Sackler Faculty of Medicine. Tel Aviv University. Israel.

13. Lafortune, L., Martin, S., Kelly, S., Kuhn, I., Remes, O., Cowan, A., & Brayne, C. (2016). *Behavioural Risk Factors in Mid-Life Associated with Successful Ageing, Disability, Dementia and Frailty in Later Life: A Rapid Systematic Review*. PLoS ONE 11(2): e0144405.

14. Hanson, V, M. (2015). *The Meaning of Successful Aging Among Older Adults with Long-Term Disabilities. Faculty of the University Graduate School.* Indiana University.

15. Jeste, D, V., Wolkowitz, O, M., & Palmer, B, W. (2011) Divergent Trajectories of Physical, Cognitive, and psychosocial aging in Schizophrenia. *Schizophrenia Bulletin.* 37(3): pp 451-455.

16. Putham, M. (2014). Bridging network divides: building capacity to support aging with disability populations through research. *Disability and Health Journal.* 7(1): pp 51-59.

17. Roth, G, M., Sun, B., Greensite, F, S., Lott, T., & Dietrich, R, B. (1996). Premature aging in persons with Down syndrome: MR findings. *American Journal of Neuroradiology.* 17(7): 1283-89

18. Sanders, J, L. & Newman, A, B. (2013). Telomere Length in Epidemiology: A Biomarker of Aging, Age-related disease, Both, or Neither? *Epidemiologic Reviews*. 35(1): pp 112-131.

19. Naidoo, V., Putnam, M. & Spindel, A. (2012). Key focal areas for bridging the fields of aging and disability: findings from the growing older with a disability conference. *International Journal of Integrated Care*. 12: e201.

20. Hammel, J., Magasi, S., Heinemann, A., Whiteneck, G., Bogner, J., & Rodrigues, E. (2007). What does Participation mean? An insider perspective from people with disabilities. *Disability and Rehabilitation*. 30(19): pp 1445-1460.

21. Braithwaite, D, O. Waldron, V, R., & Finn, J. (2009). Communication of social support in computer-mediated groups for People with Disabilities. Health Communication. 11(2): pp 123-151.

22. Osman, O, M. & Diah, N, M. (2017). Empowering people with disabilities (PWDs) via information Communication Technology (ICT): The Case of Malaysia. International Journal of Studies on Children, Women, Elderly And Disabled. 2(June): pp 86-93.

APPENDIX: Data Transformation Table

Original Variable	**Type/code**	**Transformed Variable**	**Type/code**
GENDHDI- Perceived health	categorical	NPH-Perceived Health	categorical
POOR	0	POOR	0
FAIR	1	GOOD	1
GOOD	2	GOOD	1
VERY GOOD	3	GOOD	1
EXCELLENT	4	GOOD	1
NOT STATED	9	-	Eliminated
GENDMHI- Perceived Mental Health	categorical	NMH-Percived Mental Health	categorical
POOR	0	POOR	0
FAIR	1	GOOD	1
GOOD	2	GOOD	1
VERY GOOD	3	GOOD	1
EXCELLENT	4	GOOD	1
NOT STATED	9	-	Eliminated
GENGSWL-Satisfaction WIth Life	categorical	NSL-Satisfaction with Life	categorical
VERY SATISFIED	1	SATISFIED	1
SATISFIED	2	SATISFIED	1
NEITHER SATISFIED NOR DISSATISFIED	3	DISSATIFIED	0
DISSATISFIED	4	DISSATIFIED	0
VERY DISSATISFIED	5	DISSATIFIED	0
NOT STATED	9	-	Eliminated
PMH_05-Felt belonged to community	categorical	NSB-Felt belonged to community	categorical
EVERY DAY	1	STRONG	1

ALMOST EVERYDAY	2	STRONG	1
ABOUT 2 TO 3 TIMES A WEEK	3	STRONG	1
ABOUT ONCE A WEEK	4	STRONG	1
ONCE OR TWICE	5	WEAK	0
NEVER	6	WEAK	0
DON'T KNOW	97	-	Eliminated
REFUSAL	98	-	Eliminated
NOT STATED	99	-	Eliminated
INCGHH-annual household income	categorical	NIN-annual household income	categorical
<$20,000	1	LOW	0
$20,000 TO $39,999	2	LOW	0
$40,000 TO $59,999	3	HIGH	1
$60,000 TO $79,999	4	HIGH	1
>$80,000	5	HIGH	1
NOT STATED	9	-	Eliminated
EDUDR04-Education level	categorical	EDUDR04-Education level	categorical
<HIGH SCHOOL	1	LOW	0
HIGH SCHOOL	2	LOW	0
SOME POST SECONDARY EDUCATION	3	HIGH	1
POST SECONDARY EDUCATION	4	HIGH	1
NOT STATED	9	-	Eliminated
DHHGAGE-Age	categorical	AGE-age	categorical
12-14	1	12-24	0
15-17	2	12-24	0
18-19	3	12-24	0
20-24	4	12-24	0
25-29	5	25-44	1

30-34	6	25-44	1
35-39	7	25-44	1
40-44	8	25-44	1
45-49	9	45-64	2
50-54	10	45-64	2
55-59	11	45-64	2
60-64	12	45-64	2
65-69	13	65 OR MORE	3
70-74	14	65 OR MORE	3
75-79	15	65 OR MORE	3
80 OR MORE	16	65 OR MORE	3